Still Alive With Sir Clive!

ZXir QLive Alive!

The Timex/Sinclair NorthAmerican User Groups Newsletter

Volume 10 No. 3 Autumn 2000

MEMORY MAP

Williamette National park, OR

T/SNUG Information

We wish to support the following platforms : ZX-80/81, TS-1000, Spectrum, TS-2068, Z88 and QL. If you have any questions about any of these fine Sinclairs, contact the:

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ZXir QLive Alive!

Is the newsletter of T/SNUG, the Timex/Sinclair North American User Groups, providing news and software support to the T/S community in a VOLUME of four newsletters per year; beginning with the Spring (March) issue.

T/SNUG's main goal is to preserve and encourage the use of Sinclair computers by providing an open forum for the exchange of knowledge, building and maintaining of software libraries. Providing vendors, repair service and members with free ad space.

It is the user groups and individual subscribers, rather than the vendors, that provide the pecuniary support for this newsletter. Vendors and developers receive this newsletter free of charge, though contribution from vendors and user groups is gratefully accepted. Please support our vendors and service providers whenever possible.

If you have a problem or you have solved a problem, please share it with the rest of us. No problem will be considered unimportant.

Welcome

Leon Howell

Wilf Rigter

Editor/Treasurer Publisher

You can keep T/SNUG alive by an annual contribution of $12 for one VOLUME made payable to Abed Kahale. Send check to :-

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Back copies are available for $1.00 each postpaid.

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WEBPAGES

http://users.aol.clubbbs/tsnug/
http://www.outlawnet.com/~jboatno4
ql-users@nvg.ntnu.no

TreaSury NoteS

As of September 18 , 2000, we have a balance of $802

Input/Output

by Abed Kahale

Hi Abed,

I was just doing a web search and came across the ZQA! web page. I noticed that the position of "Tape and JLO PD Librarian" was open. I would be glad to volunteer for this position if no one objected? I do have a fair amount of both PD and commercial TS2068/Spectrum software on both tape and JLO disk, and would be more than happy to make copies to any club members that requested such. Let me know if no one else has volunteered, and if not I would be happy to fill that position for the club. Bye,

Luke Perry

doidy34@yahoo.com <Luke_Perry@gstworld.net>

Hello Abed,

Thanks for the ZQA!. I really appreciate reading about anything that is going on in the world of Sinclair. Please note, my new email address is:

aw723@osfn.org

I only check this old box about 2 times a month and would not want to miss anything important. Take care,

Rod Gowen

I am having a hard time loading an old tape into my Timex computer. Can you suggest a member of your user group that could help me out. Or is the WWW sending me to a dead end.

Darrell Hamilton

djmkh@inwave.com

Contact Donald Lambert < dslambert@email.msn.com >

Hi Abed.

Thank you for the wonderful surprise of the ZXir newsletter. It was like meeting an old friend. I see you are still doing an excellent job for the Sinclair community. I am still using my 2068 on occasion, but I go to the local public library to get on the internet and e-mail at least once a week. Incidentally, my e-mail address on your listing is incomplete. It should be >effem417@yahoo.com<. Is that picture of the Indians on the level? If so, it sure is a historical item. Thanks again for remembering me,
With best wishes

Frank Mills

effem417@yahoo.com

The picture is from Tombstone Library archives.

Abed,

The last (Summer) issue of ZQA contains an article on filtering "LKDOS files" which result from the conversion of token BASIC program files into straight ASCII files by LKDOS, David Solly gives some HiSoft PASCAL code.

Here is a token BASIC program, which creates such LKDOS files and saves them to disk as a sequential file. This process is without filtering*, but is nevertheless an interesting program, the only one on my main program disk, which has not yet been described in detail. So, here goes program LISTfl !!!!

```
10  ON ERR RESET
20  CLS
30  BEEP 0.02,20
40  PRINT #RND;"Data Disk?";
50  PAUSE 0
60  LET d=CODE INKEY$ - CODE "0"
70  PRINT #RND;d
80  RANDOMIZE USR 100: GO TO d
90  RANDOMIZE USR 100:CAT "",
100  BEEP 0.2,24
110 INPUT "Entire File Name?"; LINE z$
120 RANDOMIZE USR 100: OPEN #2,z$(TO LEN
z$ -2) + "CT" + " OUT "
130  LIST
140  RANDOMIZE USR 100: CLOSE #2
150  STOP
```

Now, what we do is cram all this into only one statement line, with a number, that can be safely tucked away in, or MERGEd into, the token BASIC program file, to be converted to ASCII.

When we RUN the statement line, the system asks us for the number, from 0 to 4 say, of a drive on which we wish to store the ASCII file. Then, it CATalogs the disk, there, asking for the token BASIC file's full name, z$.

Statement 120 OPENs the SCREEN file (#2) to z$, where the extension B1, say, is replaced by CT, say, as OUTPUT.

When the next instruction LISTs the program in memory to the screen, this is LKDOS "converting Sinclair BASIC listings ... into straight ASCII text and saving them to disk as a sequential file" IN fact, we have chosen to convert z$ into an ASCII file with "CT" as the extension, for processing by MSCRIPT !

Testing the program by RAND USR 100:lprint "test.CT", where z$ was "test.B1," results in garbage printout for the initial ON ERR RESET, i.e., "unfiltered rogue bytes."

David E. Lassov

emanon@azstarnet.com (email)

Abed,

In order to avail myself of better computer graphics, we have invested $400 in a Compaq Presario CDs 924, running Windows 95A. Its processor runs at 66Mhz, like a 486 DX/2. We have 40 MB of RAM. The factory modem has been replaced by a 56k baud 1FXC. No printer, the disk system has been optimized, as follows:

Drive A: is a 5 1/4 " drive for 1.2 MB disks.
Drive B: is a 3.5 " drive for 1.4 MB disks.
Drive C: is a 2 GB partition of the hard drive with 1.4 GB free.
Drive D: is a 1 GB partition of the hard drive with ALL free.
Drive E: is a CD ROM by Mitsumi.
There is a PS/2 mouse.
Stereo sound works.

Everything checks out, save drive A. So, we have yet to devise a suitable test !

We are saving the TIMEX stuff, in anticipation of gaining dialup access from the internet, by Telnet, for example. ! K E E P O N T I M E X 'n !

David E. Lassov

David E. Lassov: Sysop, SOL BBS @ 520-882-0388 (data)
520-882-3972 (voice)
emanon@azstarnet.com (email)
2590 N. Jordan DR
Tucson AZ 85745-1132

Oi Amigo !

Look my pages that is about Lambretta history in Brazil

http://sites.guiautil.com/cultura/castrox/Lhttp://sites.guiautil

castrox@portoweb.com.br

http://sites.guiautil.com/cultura/castrox/lambringles.htm

Dear Mr. Kahale,

I have enclosed $12 for a year's subscription.

I have a TS-2068 with 48K RAM, a Twister board, TS-2040 and a **Timex Disk System**. On serial channel A, I have a Fujitsu DL 16.5" 24-pin color dot matrix printer. I would like to know how to make them work. I am using the standard 9 to 25 pin serial cables and data switch that Radio Shack sells.

When I type MOVE "filename" TO CH-A nothing happens until I press BREAK. I am having the same problem with my US Robotics Courier V.32 bis with ASL 14.4K modem.

An even worth problem I am having is getting a useable monitor connected. Background hash makes a composite monitor downright irritating to look at, but it blends in quite well with the static on a TV screen. Obviously I need an RGB monitor especially for 64 column mode. I have a nice Apollo 19" unit with all the necessary cables and adapters, and **a Zebra Systems Twister Board** with RGB connector and no sync separator. Could someone PLEASE send me a component layout (showing exactly what goes where) for the entire Twister board?

I would also like to know if the memory chip on the twister board can be used for RAM instead of a **Spectrum Emulator**, since I am not interested in Spectrum compatibility.

I have a **ZX-Interface-1** and one microdrive. Where can I get a TX ROM to use it in the Timex mode? (I don't want one of those dual ROMs with Spectrum and TX modes). Will it work with Timex disk system? I would like to be able to copy a file from any disk, **mdv** or **scp** to any other disk, mdv or scp with a single command line.

Please send me this information as quickly as possible, because I am stuck using a **TRS-80 COCO-2** until I get the Timex system going. It's not a bad computer, but the BASIC is completely inferior and I don't like RAM based operating systems like OS-9 (UNIX) on the COCO or C/PM on the Timex. DeskMate is a nice package if you like the GUI thing, but this 32-column screen is getting cramped. I want my MScript! Thank you,

PS: Where can I get a **communications** program for **TOS** (not C/PM) for use with SCP-B? It should have at least X-modem and be able to break from terminal mode to the menu. It should UPLOAD/DOWNLOAD using disk and/or mdv and work at 19.2K.

Leon Howell
6150 Monument Dr. #2
Grants Pass, OR 97526

Referring to the latest (Summer) issue of ZQA, I find two **great** examples of computer graphics, one on the cover as a desert scene, and the other on page 8 as Chiricahua Apaches.

If you can, Abed, we would all like to know the source of these images; how they were scanned or digitized, and, what hardware and software were utilized in their printing in the newsletter.

David E. Lassov

The desert scene was from an AZ magazine. The Indians picture was from the local newspaper from Tombstone library archives. I use a scanner to scan them to my PC using the graphics software (PhotoImpact ULead Sys.) that came with the scanner.

The scanners have become affordable - sometimes on sale for less than $50 after rebate. Of course you need a PC. I got mine (MicroTech) from Staples a few years ago. It can scan black and white, gray or color up to 600 DPI. And has OCR (optical character recognition) that I use to scan printed text then put it into my word processor.

Abed,

Z88 Serial Port To a PC

Yes you can connect the Z88 to a PC. You can buy a commercial transfer package called PC-Link which includes a program for the PC and Z88 as well as a cable. Or you can make your own cable and use Z88 programs available on the Internet and the PC HyperTerminal program to transfer files back and forth. I would recommend the Z88 Programs Zcp.bas and Zfu.bas. Both programs are written by Richard Haw. Zcp is an XModem program. You use the built-in VT-52 terminal program. Zfu is a file archiving utility.

With ZFu you can archive all the files on your Z88 into one file. Then use Zcp to transfer that file to your PC. When your Z88 crashes or more likely you don't use the Z88 for a while and the batteries go dead you can transfer that one file to your Z88 and be back up and running. You must have Zcp.bas and Zfu.bas on an EPROM. Look in the Z88 Forever site on the Internet for the Z88 files. Or I can send them to you as file attachments. The kermit.bas program which was one of the files in the defunct Z88 Users' Club Library also works well and you can transfer multiple files at the same time.

I made my own Z88 to PC cable which has the following specifications. The Z88 has a male DB-9 plug. The PC has a female DB-9 plug. Pin 2 on the Z88 goes to pin 2 on the PC. Pin 3 on the Z88 goes to pin 3 on the PC. Pins 4 and 5 are connected together on the Z88. Pins 7 and 8 are connected together on the PC. Pin 7 on the Z88 goes to pin 5 on the PC. Pin 8 on the Z88 goes to pin 4 on the PC. Pin 9 on the Z88 goes to pin 6 on the PC. Have fun with your Z88!

Dave Bennett
daveb357@juno.com

Hello Abed,

My name is Wilf Rigter and I have been a long time ZX81/TS1000 aficionado. I live in the Vancouver BC Canada area and would like to know if you are planning a meeting this year. I don't know if you still put out a

newsletter but if so I would like to contribute some of my reminiscing and some more current projects. I have over the last few years contributed to various ZX81 software, hardware and emulator projects on the web. i.e.

http://www.xs4all.nl/~rodneyk/index_e.html

Anyway it's a long story and I will save it for later. I look forward to hearing from you. best regards

Wilf Rigter

Hi Abed,

Thanks for the quick reply. Yup, I was one of the last three VSUG diehard members before the club faded. Rod Humphreys had left the club somewhat earlier. Rods work with ZX Appeal is probably what made VSUG so successful and kept things going long after the world went big blue. No doubt your own continuing newsletter had the same effect. How many subscribers are there anyway?

I would love to get a copy of the ZXir QLive Alive. My guess is that ZX81 interest in north America is minimal but I do have a QL although it's getting a bit dusty compared to my ZX81. I also have a collection of British ZX/QL mages and could scan hard to find articles for you. I would guess that "e" version would be less costly but would not reach the entire subscription list. However submissions of articles, proof reading, corrections etc will be a lot easier then in the past. My mailing address is

Wilf Rigter
Powertech Labs
12388 88 Ave
Surrey, BC, Canada V3W 7R7
Thanks very much and I'll be in touch. take care
Wilf.Rigter@powertechlabs.com

Hello Abed,

I bought my first Zeddie (as the Europeans like to call them) back in 82 from Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH. It so happened that I saw "The $99.95 personal computer" advertisement in a copy of Popular Electronics while on a training course in Boston, and a few hours later I found myself in Nashua asking for directions to Sinclair Plaza. Eh? Never heard of it? Criss-crossing town, I kept looking and asking for this high tech office tower / research complex and receiving shrugs and puzzled looks for answers until at last a gas station attendant lit up in a smile and described its location as "a big building with large parking lot two block down the road on the right. At the appointed place, a brooding, near empty, converted textile mill loomed over an empty parking lot with a few store front windows displaying household wares facing the road

Hope fading, I entered a store specializing in stoneware/pottery and inquired, when lo and behold, the sales person somewhat sheepishly pointed at the end of the counter where a miniature version of the $99.95 personal computer was connected to a television. So I finally found myself at the hub of the North American Sinclair distribution network, stunned to discover that this was indeed a **full** size ZX81. Comparing it to the advertisement, I noticed the clever perspective used to make the PC in the ad look larger than life, so large in fact that it could not possibly fit on the page. Undaunted, I jabbed a few "keys", wrote my first "Hello World" program and was hooked.

Over the years all those shortcomings of the ZX81 were merely challenges to be overcome. As a result I got pretty intimate with the in and outs of the ZX engine and came up with some clever circuit designs that follow the same simplicity which attracted me to Sir Clive's creation in first place. Various I/O cards, memory, keyboard and joystick extensions as well as cunning little low level drivers that allowed multitasking and hires graphics kept the ZX alive and useful for a variety of control projects.

My "piece de resistance" was a completely reverse engineered ZX81 which replaced all power hungry parts including the ULA with a design I called the ZX97. It draws just 50 ma using 23 HC type and other CMOS parts including 24 bits of I/O, 188K of memory and supports various hires/programmable character video modes.

So unlike most ZX81s that still inhabit this world, some of mine are not gathering dust but are instead performing some useful tasks around the house. While not exactly controlling the world one is used as my alarm clock and the ZX97 hangs on the wall over my work bench endlessly scrolling four different pictures of the family in glorious black and white 256x192 resolution.

I have attached two articles I wrote in '98 which may be of interest. One deals with interfacing a character LCD to a ZX81 (or a 2068/Spectrum) for small controller applications (weather station etc). The second article deals with a novel Z80 microcontroller architecture I call the EZ80 that uses many of the design elements of a ZX81 and can be coldbooted from a ZX81 BASIC program. They were previously emailed to a few people on the ZX81 mailing list but are well worth re-reading. regards

Wilf Rigter
Vancouver BC

Hello Abed ...

Here is a little something for you. It is a screen attribute look-up table for ink and paper colours. You can refer people back to my article *Changing the Permanent Screen Attributes from within a HiSoft Pascal Program.* ZQA! v. 4, n. 6, Winter 1999 for an example of how the table can be used.

My father's 80th birthday celebration was a huge success. He was so surprised that for a moment I though he was going to burst into tears. He soon relaxed and really enjoyed himself. In the end, about 40 relatives made it to the party. My present to him was a photographic portrait of myself done up 1930s style. I was even able to dig up an exact match to the suit worn by my grandfather in a picture we have of him. My aunts think I look like a banker -- if only! I am attaching a jpeg copy of it which you may use in ZQA! if you wish. Take care.....

David Solly
Ottawa, Ontario

From 0 to 63: BRIGHT 0, FLASH 0

	PAPER							
	Black	Blue	Red	Magenta	Green	Cyan	Yellow	White
Black	0	8	16	24	32	40	48	56
Blue	1	9	17	25	33	41	49	57
Red	2	10	18	26	34	42	50	58
Magenta	3	11	19	27	35	43	51	59
Green	4	12	20	28	36	44	52	60
Cyan	5	13	21	29	37	45	53	61
Yellow	6	14	22	30	38	46	54	62
White	7	15	23	31	39	47	55	63

From 64 to 127: BRIGHT 1, FLASH 0

	PAPER							
	Black	Blue	Red	Magenta	Green	Cyan	Yellow	White
Black	64	72	80	88	96	104	112	120
Blue	65	73	81	89	97	105	113	121
Red	66	74	82	90	98	106	114	122
Magenta	67	75	83	91	99	107	115	123
Green	68	76	84	92	100	108	116	124
Cyan	69	77	85	93	101	109	117	125
Yellow	70	78	86	94	102	110	118	126
White	71	79	87	95	103	111	119	127

From 128 to 191: BRIGHT 0, FLASH 1

	PAPER							
	Black	Blue	Red	Magenta	Green	Cyan	Yellow	White
Black	128	136	144	152	160	168	176	184
Blue	129	137	145	153	161	169	177	185
Red	130	138	146	154	162	170	178	186
Magenta	131	139	147	155	163	171	179	187
Green	132	140	148	156	164	172	180	188
Cyan	133	141	149	157	165	173	181	189
Yellow	134	142	150	158	166	174	182	190
White	135	143	151	159	167	175	183	191

From 192 to 255: BRIGHT 1, FLASH 1

	PAPER							
	Black	Blue	Red	Magenta	Green	Cyan	Yellow	White
Black	192	200	208	216	224	232	240	248
Blue	193	201	209	217	225	233	241	249
Red	194	202	210	218	226	234	242	250
Magenta	195	203	211	219	227	235	243	251
Green	196	204	212	220	228	236	244	252
Cyan	197	205	213	221	229	237	245	253
Yellow	198	206	214	222	230	238	246	254
White	199	207	215	223	231	239	247	255

Original Chart from: *Clefs pour le ZX Spectrum et Timex 2000* by Jean-Francois Séhan.
English version by: David Solly, Bibliotheca Sagittarii, Ottawa, Canada.

From The Chairmans Disk

Donald S. Lambert

Looking back and thinking about the years of enjoyment with the T/S 2068 I fondly remember the first T/S Fest which was in Indianapolis in May of 1987. That was my first time to see all the goodies that were available for the T/S enthusiast. I was like a kid in a candy store for the first time with some money. I met a lot of people that before that were just names in the magazines and newsletters. 1987 was a year of a lot of changes for me. In December of that year I retired from 35 years of work at Collins Radio Company.

1988 was a year of three T/S Fests but since a trip was planned to go to Japan to see my in-laws I was unable to attend any of those Fests on my return from Japan I ordered the LarKen disk system from Larry Kenny and that began a new adventure.

1989 was the year of the GATS Fest and I attended and flew in from Ft. Wayne to attend. I again saw a lot of T/S folks and met a lot of new ones.

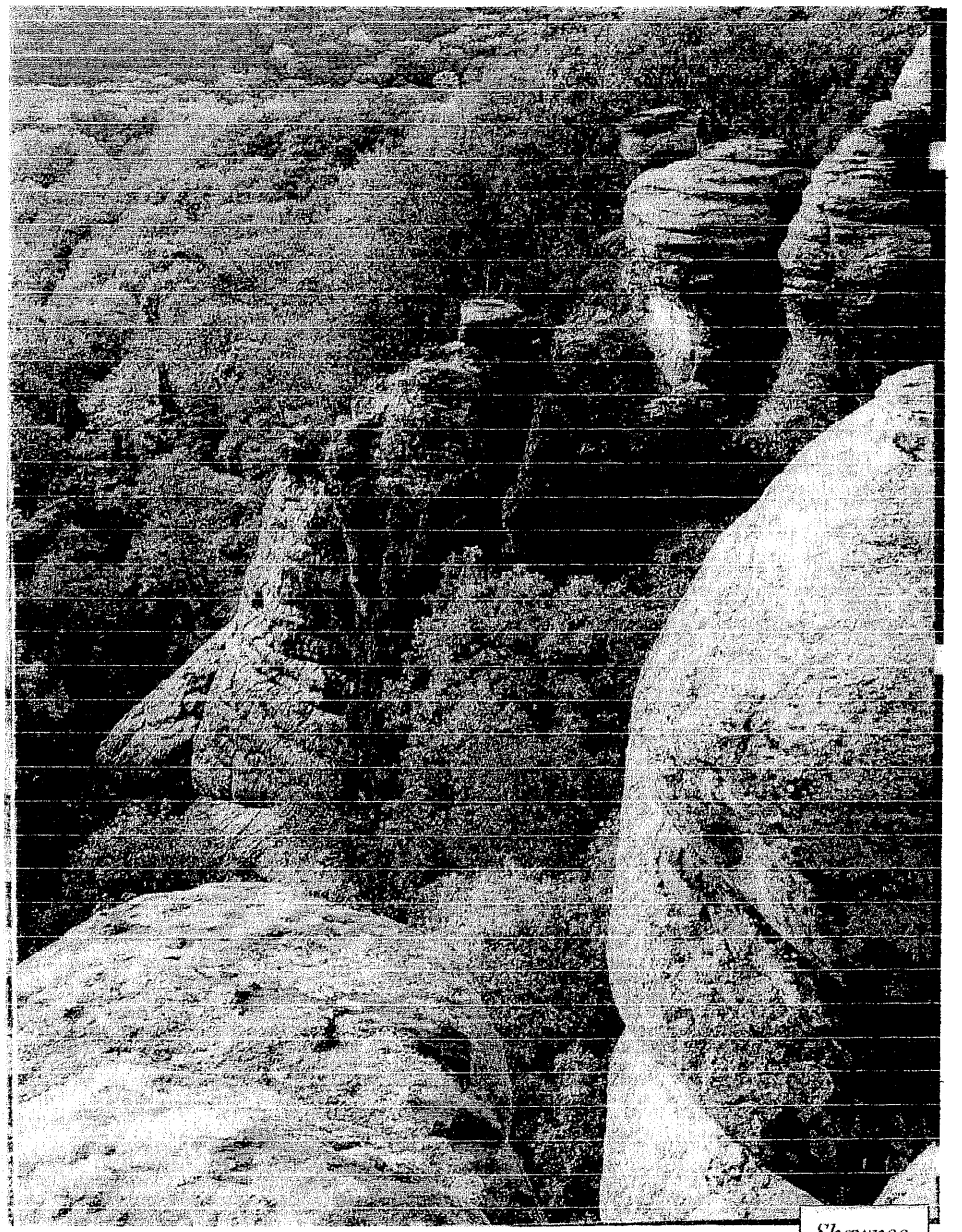
1990 was the year of the SMUG Fest. again I attended by then I was acquainted with many more people It was the year we moved from Cedar Rapid, IA to Auburn, IN which put me into driving range of ISTUG and Frank Davis and Paul Holmgren. I attended all the meetings of ISTUG that I could and learned a lot.

When the T/S groups joined up to attend the Dayton Computerfest in the last of August I did my best to attend all the T/S gatherings there When attendance dropped off the decision was made for the T/S groups not to go to the Dayton Computerfest. By then the memberships of the usergroups had dropped tremendously.

Part of our move from Auburn r IN to Forsyth, IL was having to part with almost all my T/S computer stuff which went to Jack Boatwright. after the move I bought a Compaq Presario 5715 computer to be able to be on line and continue with my computer experiences. I have since added a CD RW drive to the computer.

I a still interested in the T/S computers although the only one in the family that I have is the Z88. My attempts to successfully move files from the Z88 to the Compaq Presario that I have have failed since I still haven't mastered the PC enough to be able to do that. I have learned some but not enough to do that.

However, I do en joy reading about the activities of the T/S enthusiasts and while I am in the role of a passive mater hope to break the barrier to enable me to successfully transfer files to and from the Z88 to and from my PC



Shawnee

Playing with and using a computer is not my sole activity. I still have the honey-do projects and daily activities to do. since I am a senior citizen I find that it takes longer to do things than it used to. it takes more energy to do the same things that I used to do speedily. Let' s face it I never expected to live this long and be this active if I did Every time I get caught up on the honey do projects my wife finds yet another thing to do. 0/0

ZX-81 Video Display System

A tutorial by Wilf Rigter, last revision 7 Sept 1996 Part 4

13. ZX-81 Fast Mode Video Routines

In order to speed up application program execution time, the FAST mode uses 100% of the CPU time for executing the application program but there are times when the application program is idle. When the program is STOPped or PAUSEd or waiting for keyboard INPUT, the keyboard is checked and if no key is down the video is generated independent of NMI pulses. In fact, the ZX-81 FAST mode video routine was designed to be compatible with the ZX-80 hardware so the ROM could be used as a retrofit ROM upgrade. Since the Z)C80 generates the blank lines in software, the ZX-81 ROM does the same when in the FAST mode.

The loop of VIDEO routines for FAST video starts with the FRAME/KBDNSYNC routine at 229:

0229 Decrement Frame Counter
023D EXIT Fast Video If Frames=0 (End Of Pause)
023E Check Keyboard
0260 EXIT Fast Video If New Key Pressed
0292 SAVE The Video Pointer In LX (0281)
029B JR Z. 02A9 To Blank Line Routine
02A9 Generate Blank Lines
02B3 JP (IX) TO 0281
0281 Generate The DFile Display
0292 SAVE Video Pointer (028~ 029B JR Z.
02A9 To Blank Line Routine
02A9 Generate Blank Lines
02B3 JP (IX) TO 028F)
028F JP 229 Back To Frame Counter

Since most of the routines were described in the SLOW Mode Video chapter, only the differences are described here. Compare the way the SLOW mode enters this loop from end of blank line application program execution by saving the main registers of the program and restoring them at the end of 0292. By contrast, the FAST mode does not save any registers and branches out of the 0292 restore main register routine to literally generate the blank lines. This is done at 029B after testing the FAST fl3g and jumping to a less known routine called Display-4

```
02A9        ;DISPLAY-4
LD A,FC;first R delay to TNT
LD B,01;one row
CALL 02B5  ;display blank lines
DEC HL      ;point back to HALT
EX (SP),HL ;delay 19T
EX (SP),HL ;delay 19T
JP (IX)     ;IX = 0281 or 028F
```

The routine at 02A9 is called twice each frame to generate the top and bottom blank lines with HL pointing to either the first HALT at the start of DFILE or the last HALT at end of DFILE. Reg C holds the number of blank lines and reg B is set up for 1 row. After VSYNC the 31 top blank lines are generated by calling the display routine at 02B5 and executing the first HALT at the START of DFILE 31 times. After returning from the display routine HL points to the last HALTs1 and DEC HL is required point HL back to the last HALT of DFILE. After saving the return address in IX, the routine at 029A is reentered with HL pointing to the last HALT and generates the bottom 31 blank lines by executing the HALT at the END of DFILE.

14. True Hires Video Software

The true hires core routines are distinguished by the use of the I and R register pair as address pointers for the display file. The only other requirement is to execute 32 NOP instructions (or equal) per horizontal line and to update the I and R registers during HSYNC time. More blank lines can be used above and below the display for faster application execution. The listings are compatible source code for the ZXAS assembler both on the ZX-81 and under XTender, the ZX-81 emulator form Carlo Delhez. Check current version of XTender for hires computability. These ASCII listings can be used to prepare a formatted 2 REM .I file with the ZXAS COM program from Jack Raats

WRX16 - 1984 Wilf Rigter

This is the hires (high resolution) core used in programs by Fred Nachbaur and Greg Harder. It creates a 256x192 high resolution display in a 6144 byte array starting at (HFILE), which can be poked directly from BASIC programs. START is used to start the hires display and STOP restores the Sinclair video. It has a characteristic signature with the I register value greater than 2000 hex. PART 1 calls LBUF 192 times, displaying 256x192 pixels. calculates blank lines, saves pointer to PART 2 in IX and returns to application code. PART 2 calls VSYNC etc. calculates blank lines, saves pointer to PART 2 in IX and returns to application code execution.

```
;ORIGIN = 16516 (hex 4084)
LBUF        ;Displays one line of 256
Dixels
;like DFILE, it is called above 32K to
activate the ULA video
;hardware. The hires bytes may be
inverted for special effects
;by setting bit 7 of the NOP codes .
The hires data is loaded
;into  the  ULA  video  shift  register
during the refresh cycles of
;the 32 NOP opcodes when the I and R
registers sequentially
;address 32 bytes of hires data in the
6144 byte HFILE
LBUF
    LD R,A ;Now load R register
    00 00 00 00    ;32 bytes of 8 pixels
    00 00 00 00
    00 00 00 00
    00 00 00 00
    00 00 00 00
    00 00 00 00
    00 00 00 00
    00 00 00 00
```

```
    JP (IX)     ;Return to HR
HR :HIRES DISPLAY ROUTINE PART 1
    L D B,04        ;load delay
HRO     DJNZ HR0        ;delay 56T states
to synchronize with HSYNC pulses.
    LD HL,(HFILE)  ;RAMTOP points to the
first HFILE byte
    LD B,CO         ;48 horizontal lines
    LD IX,HR1       ;save the return
vector in IX (for JP (IX) at end of
LBUF)
    JR HR2      ;skip HR1 first time
through the loop
HR1     LD DE,20        ;this value for 32
bytes or 256 pixels per line is
    ADD HL,DE       ;added to HL to point
to the start of the next HLINE
    DEC B           ;repeat 48 times
    JP Z HR3        ;if this is the last
line JP to HR3
HR2 LD A,H              ;the address in HL
is then transferred to
    LD 1,A      ;I register
    LDA,L           ;and dunng LBUF to
the R register
    JP C084     ;jump to LBUF @} 4084 +
8000 to start the ULA
HR3 LD IX,HR4       ;save the video
vector so that NMI retums to HR4
    JR HR5      ;now get blank lines and
return to appiication code

HR4 ;HIRES DiSPLAY ROUTINE PART 2
CALL 220
LD IX,WRX16
HR5 LD A,(4028)
JP 29E
;first PUSH registers then jump to
VSYNC, etc
;save the video vector so that NMI
returns to HR
;33 or 19 blank lines in system
variable MARGIN
;save blank lines, start NMI, POP
registers and RETURN
--- end of listing --
```

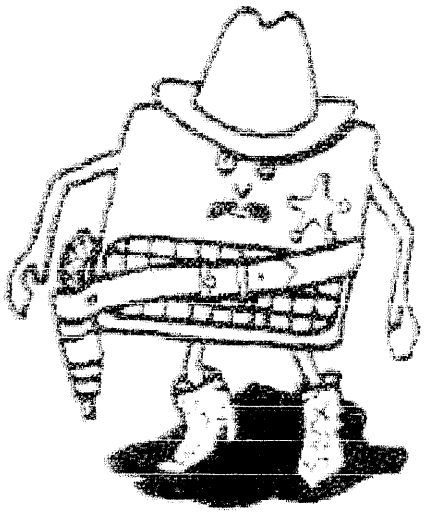
The hires video is started and stopped by changing the vector address in register IX which is used by NMI to JP (IX) to the video routine. The following routines are synchronized with the display so that the changeover in video mode occurs without display breakup. STOP :STOP hires video and return to Sinclair video

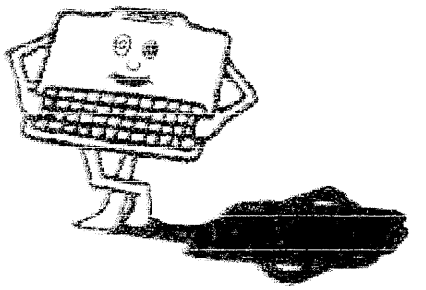
```
LD HL,0281
LD A,1E
LD 1,A
JR SYNC
START :Start the hires video
;pointer to SINCLAIR video routine
;SINCLAIR ROM pattern table MSB base
address (1E00)
;pointer to I register
    LD HL,HR    ;pointer to the hires
video routine
SYNC :used bv START and STOP to
smoothlv chanae video mode
PUSH HL
LD HL,4034
LD A,HL
SYNC1 CP A,(HL)
JR Z SYNC1
POP IX
END OF LISTING--------
;FRAMES counter
vget old FRAMES
;compare to new FRAMES
;exit after a change is detected
:SINCLAIR video routine
```

Guus-Flater bv Enno Borgesteede (1984)

This hires core uses a ingenious way to intercept the video vector. Instead of changing the value of the IX register, Guus-Flater intercepts at the beginning of the DFILE execution by changing the first 4 bytes including the HALT to DI and JP 409F which is the start of the hires routine. At the end of the hires screen the program simply rectums to ROM routine at xxxx. It has a characteristic DFILE starting ,ith fhn rDI and JP 409F and the HFILE starts at (4004)

```
(400C)
409F 40A1
    ,   40AD
!1
    jl  40B6
40B8
40D8
40DB
40DC
40DE
40E0
40E2
I
D1
JP 409F
LD B,08
DJNZ 40A1
LD A,R
LD B,C0
LD DE,20
LD HL,(4004)
LD A, H
LD 1,A
LD A, L
LD R,A
"COPYRIGHT 198.
JP 40DB
ADD HL,DE
DJNZ 40AD
LD A,1 E
LD 1,A
RET
HRG7 - in progress
;these bytes are loaded into DFiLE
;to vector to the hires routine
sdelay
;dclay
; delay
; 192 lines
;32 bytes per line
;hires file (HFILE) starts at RAMTOP
;MSB address of HFILE
;load MSB of HFILE pointer
:JUMP above 32K
;load LSB of HFILE pointer
```





```
a ENNO BORGESTEEDE "; same as 32 NOPs
;JUMP below 32K
;next hires line
;next line repeats 192 times
;restore ROM pattern table pointer
;load pointer
;join the SINCLAIR video in progress
WR)(16K - 1996 wilf riqter
<riqterRincafe.net>
```

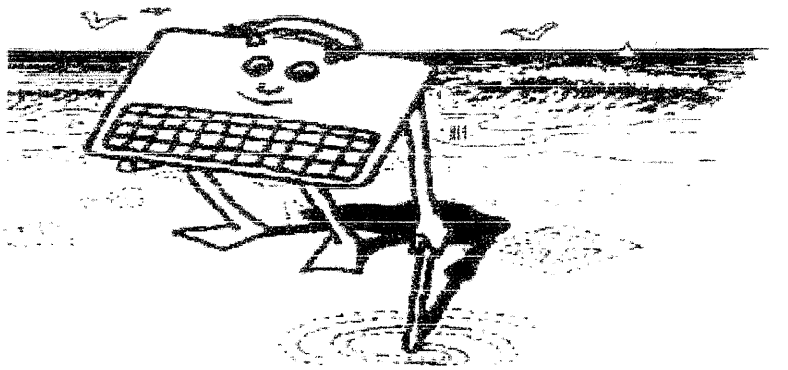
The original WRX was written in 1984 but recent renewed interest has yielded newer more efficient versions. WRX16K 1996 is the most compact version of the WRX yet and will display a true bit mapped 256x192 hires screen. It was designed to work with the modified 16K RAMPACK or 16K SRAM and you must first lower RAMTOP with POKE 16389,96 then NEW before loading.

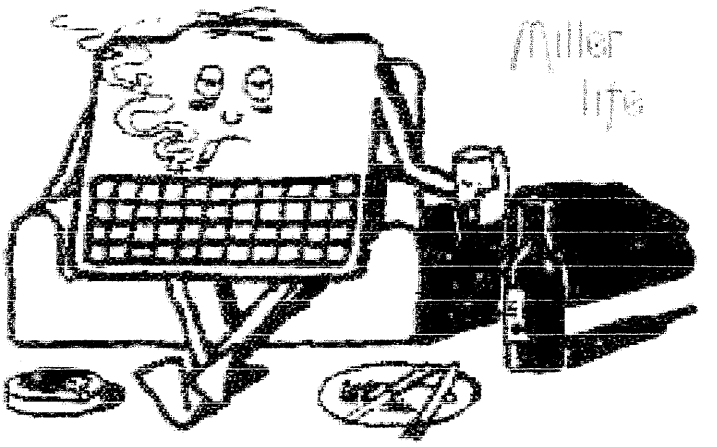
The hires mode can be started and stopped with the same routines shown in the WRX16 listing above. The simple START is used for starting the hires mode by changing video vector address in the IX register. Hires is stopped with the inline code segment called "BREAK" which returns synchronously to the Sinclair video mode when the space key is pressed. The HFILE is a 6K linear array starting at (4004) but is easily relocated. Note that HFILE must start on a 32 byte boundary (2000,2020, etc).

```
ORG
;16516 (hex 4084)
    START   LD IX,HR    ;simple start of
the hres mode
        RET
            ZX-81 VIDEO DISPLAY SYSTEM
    XVI
    LBUF    LD R,A
        0 0 0 0
        0 0 0 0
        0000
        0000
        0000
        0000
        0000
        0000
        RET NZ
    HR
        LD B,7
    H R0    DJNZ HR0
HR1
HR2
BREAK
STOP
HSCRN 2000
Note:
;load HFILE address LSB ;32 NOPs = 256
pixels
;always returns
DEC B
LD HL,(4004)
LD DE,20
LD B,C0
LD A,H
LD 1,A
LD A,L
CALL C089
ADD HL,DE
DEC B
JP NZ HR1
CALL 292
CALL 220
CALL F46
LD A,1E
LD 1,A
JR NC STOP
LD IX,HR
JP 2A4
sdelay
;delay
sreset Z. flag
;HFILE starts at RAMTOP or HSCRN (note
below)
;32 bytes per line
;192 lines per hires screen
sget HFILE address MSB
;load MSB into I register
;get HFILE address LSB
;CALL LBUF + 8000
;next line
;dec line counter
;last line
;return to application program
;extra register PUSH and VSYNC
;this code segment is optional
;check break key
;restore pattern table pointer
;skip the HR vector load if BREAK
;load the HR vector
;retum to application program
;this is used with SRAM at 8K - 16K
```

HFiLE can be relocated to use SRAM between 8 to 16K by changing LD HL,(4004) to LD HL,(HSCRN).

— end of listing "





Z80 LCD

by Wilf Rigter

Many of us have dreamed of controlling the world with a ZX-81 (what else is it good for?).
For standalone or portable applications, a TV or monitor display is quite bulky and power hungry. You need a portable low power display and that would be a job for the Z80/LCD display. A ZX-81 with some I/O or for that matter the EZ80 controller (a 7 chip ZX-81 compatible controller with a keyboard, a serial port which needs about 10-20 ma at 6V) makes a nice compact package easily tucked away. The terminal software can be MTERM running in the FAST mode at 1200 baud with a patch to the ZX-81 ROM to write characters to the LCD instead of DFILE. It would copy DFILE to LCD Display RAM and use scroll to read the whole screen on a 2 or 4 lines of 40 character LCD.

How about writing some software to adapt the MTERM communication program? You can develop and run it on a PC under XT2, the ZX-81 emulator with a patch to the PC com port to emulate the Timex/Sinclair 2050 modem.

I have attached the final version of the Z80/LCD interface circuit, new driver software, and a little demo for printing 2 strings. The main difference is that Z80/LCD design is now robust and tested on several system I have added extra code for using 4-bit operation. The latter was not to save I/O pins (there aren't any to save on the CPU bus 8^) but because a number of surplus LCD's only have 4 data pins available. I have checked the Z80/LCD V0.3 circuit and software on 2 different ZX-81s and 3 different LCD's with no problems.
So here is the Z80/LCD V0.3 article.

Z80/LCD Assembly Source Code

wilf.rigter@powertech.bc.ca or rigter@cafe.net

Introduction

Interfacing an LCD to the ZX-81 generally uses an 8255 type parallel printer port for generating the data and control signals for the LCD. This requires 7 or 11 I/O lines depending on the data path width which is selected. It was clear from the 8255 MC code listing that there is a lot of software required to generate the various read/write/data and command control sequences. This makes the LCD more difficult to use and in practice means LCD software modules are used as simple black boxes without realizing the full potential of this LCD. In the case of a single chip controller like the 16C84, you don't have any choice but to use I/O ports for interfacing the LCD. However Z80 I/O devices can connect directly to the CPU bus, thereby minimizing hardware and software complexity.

Here is a design to interface the industry standard Hitachi type 44780 alphanumeric LCD directly to the Z80 CPU bus. A standard Z80 I/O decoder circuit can not be used since it does not have the required control timing. The Z80/LCD circuit provides the required control timing and adds a wait state for Z80 CPUs with a maximum clock of 4 MHz.

The LCD uses the HD44780 (or equal) controller chip which uses 11 commands to translate ASCII data to a dot matrix display. The LCD interfaces through a 14 (or 9) pin connector with a parallel I/O device like a printer port or single chip micro I/O port. It is less commonly used with a CPU bus. The LCD controller was originally designed for the 6800 CPU and is therefore not directly compatible with the Z80 bus.
The LCD controller requires 4 or 8 data bits, a register select (RS) line, an R/W signal and an E (clock) signal. For simplicity, the 4-bit mode is used which is selected during LCD initialization.

The basic interface operation consists of generating a positive logic E signal with a minimum of 200 ns delay from the time the other bus signals are stable. The minimum duration for the E signal is 450 ns during which all other signals must be stable. Data is clocked in on the falling edge of E. Data, RS and R/W have a minimum hold time of 10 ns after the falling edge of the E signal.

The timing diagram shows the **real** timing as measured with a storage scope. This is different from the data handbook timing diagrams. I have tried two different ZX-81 units and 3 LCD's all of which work fine Adding an inverter in the clock line would probably fix timing problems in other circuits if they should occur. It is a good idea to first read the LCD data sheet and check out the many excellent websites dealing with LCD applications. If you still have problems, call me.

The 74HC74 is configured as a 2 stage counter with stage 1 as a one wait state generator and the E signal generated by stage 2. The 2nd WAIT pulse in the diagram is ignored by the CPU. The diode which is "wired or" to the CPU WAIT line is only required for the ZX-81. A direct connection to the CPU WAIT input would be used in other Z80 applications. The 74HC138 in this design would normally be present for conventional I/O decoding so the only additional components are the 74HC74 and 1/6 of a 74HC04 chip and a diode.

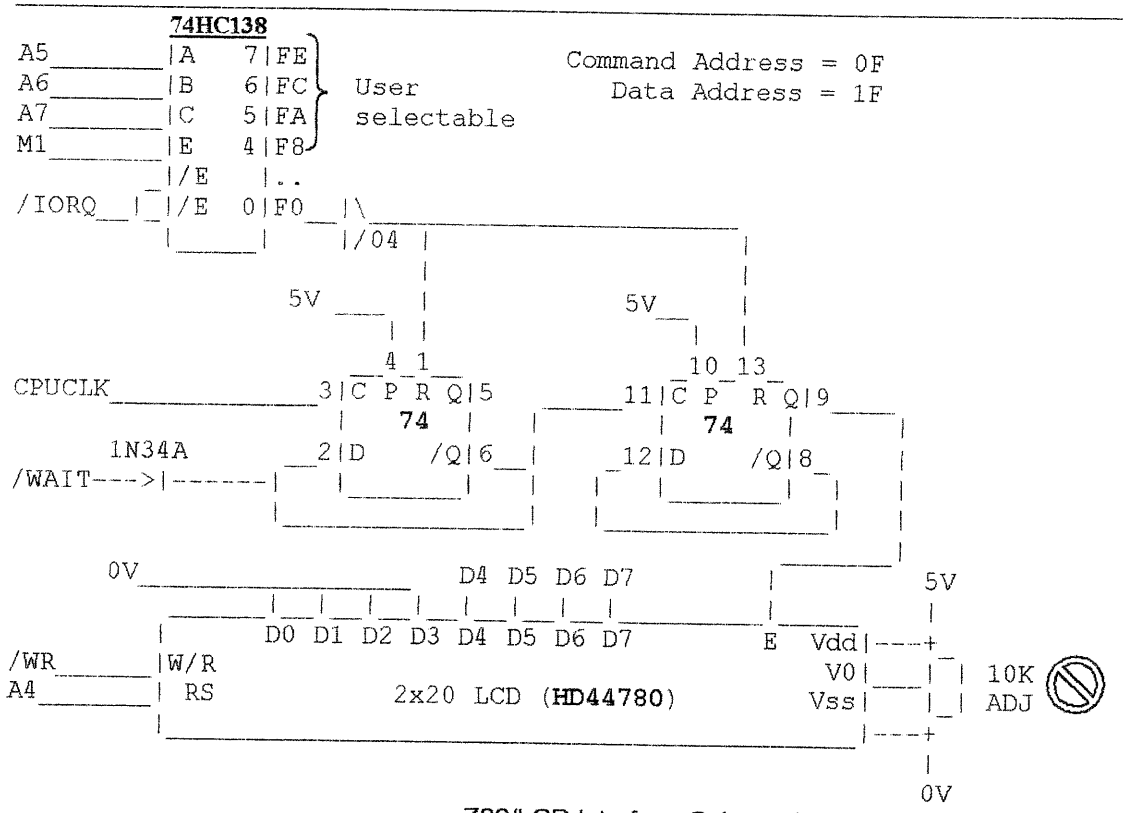
The software was written to support both 9 and 14 pin LCD. This means all data bytes are transferred 4 bits at a time (nibbles). The pinouts for the LCD connectors are shown below. The 9-pin connector pins were found by experiment. The 14-pin connector is standard but please note that pin 3, which is the display contrast adjustment input (V0), has a value of 0 to +5V for normal LCD's but 0V to -5V for extended temperature displays. For the normal LCD a 10K pot can be connected between Pin 1 and pin 2 with the wiper connected to pin 3.

Z80/LCD - A Z80 TO HD44870 LCD Interface
Beta version 0.3 (c) Oct 18, 1998

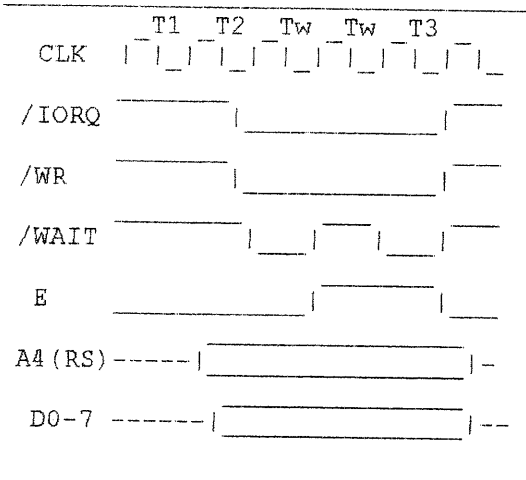
```
;ZX-81 LCD-PRINT STRING
      ;V0.2 OCT 18,1998
      ;W. RIGTER
      ;HD44780 2X20 CHAR LCD
      ;4 BIT INTERFACE
      ;ALL DATA IS TRANSFERRED
      ;IN 2 NIBBLES ON D4-D7
```

```
;EXCEPT INITIALIZATION
LCDDATA=9F              ;LCD DATA ADDRESS
LCDCTRL=8F              ;LCD CONTROL ADDRESS
ENTRY=06                ;INCREMENT/CURSOR SHIFT
START LD A,30           ;INIT CODE IN D4-7
      LD B,3            ;WRITE FUNCTION 3X
INIT1 CALL DCW          ;CMND WRITE WITH
      DJNZ INIT1        ;DELAY LOOP
INIT2
      LD A,20           ;4 BIT MODE SEND
      CALL DCW          ;IN 1 NIBBLE
      ;NOW ALL DATA IS SEND IN
      ;2 NIBBLES PER BYTE
      LD A,28           ;4 BIT MODE, 2 LINE, 5x7
      CALL CW           ;COMMAND WRITE
      LD A,08           ;DISPLAY OFF
      CALL CW           ;CMND WRITE
      LD A,01           ;HOME+CLEAR DSPLY
      CALL CW           ;CMND WRITE
      LD A,ENTRY        ;ENTRY MODE
      CALL CW           ;CMND WRITE
      ;END OF INITIALIZATION
      LD A,0F           ;DSPLY ON,CURSR ON
      CALL CW           ;COMMAND WRITE
      ;WRITE 2 STRINGS TO LCD
      LD A,80           ;SET DDRAM ADRS=00
      CALL CW           ;START OF LINE 1
      LD HL,ASC1        ;STRING 1
      CALL STRNG
      LD A,C0           ;SET DDRAM ADRS=40
      CALL CW           ;START OF LINE 2
      LD HL,ASC2        ;STRING 2
      CALL STRNG
      RET
STRNG LD A,(HL)         ;GET EACH CHAR
      INC HL
      CP FF             ;LAST CHAR
      RET Z             ;RETURN
      CALL DW           ;DATA WRITE
      JR STRNG          ;NEXT CHARACTER
      ;BUSY/DATA WRITE
DW    CALL BUSY         ;LCD READY?
      OUT LCDDATA,A     ;MSB DATA
      RLA               ;SHIFT LSB TO MSB
      RLA
      RLA
      RLA
      OUT LCDDATA,A     ;LSB DATA
      RET
      ;DELAY/COMMAND WRITE
DCW
      PUSH AF           ;SAVE COMMAND
      LD DE,2000        ;DELAY TIME
DCW1  DEC DE            ;SOFTWARE LOOP
      LD A,D            ;TEST FOR DE=00
      OR E
      JR NZ DCW1        ;IS DE=00?
      POP AF            ;GET COMMAND
      OUT LCDCTRL,A     ;MSB ONLY
      RET
      ;BUSY/COMMAND WRITE
CW    CALL BUSY         ;LCD READY?
      OUT LCDCTRL,A     ;MSB COMMAND
```

```
        RLA                 ;SHIFT OVER 4 BITS
        RLA
        RLA
        RLA
CW1
        OUT LCDCTRL,A       ;COMMAND
        RET
        ;TEST BUSY FLAG
BUSY
        PUSH AF             ;TEMP SAVE AF
BSY1    IN A,LCDCTRL        ;RD BUSY FLAG
        RLA                 ;SAVE BS IN CARRY
        IN A,LCDCTRL        ;NEXT NIBBLE
        JR C BSY1           ;UNTIL BS = ZERO
        POP AF              ;RESTORE AF
        RET
        ;ASCII="! ENJOY  -  WILF !"
ASC1    21 20 65 6E 6A 6F 79 20  FF
ASC2    B0 20 77 69 6C 66 20 21 FF
```



Z80/LCD Interface Schematic



9-pin	14-pin	Function	
1	1	0V	
2	2	5V	
	3	V0	Adjust contrast
3	4	RS	Register select
4	5	R/W	Read/Write
5	6	E	Clock
	7	D0	
	8	D1	
	9	D2	
	10	D3	
6	11	D4	These pins
7	12	D5	used for
8	13	D6	4 bit
9	14	D7	operation

Z80/LCD Interface Timing 9/14 PIN LCD Connectors

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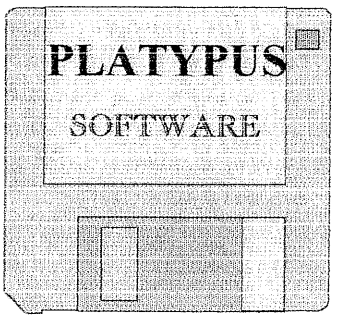

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